IEEE P802.11
Wireless LANs

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| Updates to REVmc 5.1.5 |
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**Discussion**

Revision History

R0 – First revision. Captures discussion from ARC SC face-to-face meeting, March 2015.

Abstract

This document is a follow-up to 11-13/113, with proposed updates to subclause 5.1.5 material (mostly the figures), for consideration by ARC SC, and then TGmc.

The material in 11-13/113 has been reviewed, discussed and considered by both ARC SC and TGmc, previously, and resulted in agreed changes adopted into REVmc D3.0. Since that time, the ARC SC has had further review, and believes some of the figures proposed in that document could be improved for clarity to the reader.

This document presents the latest thinking on this topic.

Two changes have been identified to date:

The first is to clarify the two-ended arrows that were used within the role-specific behavior blocks. The two-ended arrows have proved to be confusing, in terms of whether the “switching function” (or potentially other logical function) within the blocks is always applicable in both directions shown by the arrows.

To address this confusion, it is suggested to split the bi-directional arrows into two uni-directional arrows, and clearly show what functions or operations are applied in each direction.

The second change is to allow for entities “above the MAC”, but still within the MAC sublayer , Figure 5-1 is redrawn to move the role-specific behavior block down a bit, and create a space between this block and the LLC sublayer boundary.

This allows the role-specific block figures to show the architectural support for entities such as bridges and 802.1AC convergence functions, necessary as 11ak is introduced.

The newly proposed Figure 5-1:



*Figure 540-1 – proposed update to Figure 5-1*

And, the matching updates to Figure 5-2:



*Figure 540-2 – proposed update to Figure 5-2*

Proposed changes to Figures 5-3 through 5-6, and text changes to correspond to the changes, and add explanation to the figures.

**5.1.5.2 Non-AP STA role**

The MAC data plane architecture of a non-AP STA is completed by replacing the role-specific behavior block with that shown in Figure 5-3 (Role-specific behavior block for non-AP STA). The function of this block in a non-AP STA is to perform destination address filtering as described in 9.2.8 (MAC data service).

NOTE—In actual implementations, the DA address filtering function often is done “lower in the stack”. It is shown in the role-specific behavior block location for simplicity, and any implementation choice needs to provide equivalent behavior.



*Figure 540-3 – proposed update to Figure 5-3*

**Proposed changes below are still under discussion**

**5.1.5.2 AP role**

In an AP, the MAC data plane architecture includes distribution system access in its role-specific behavior block, as shown in Figure 5-4. This block performs destination address filtering as described in 9.2.8 (MAC data service), and provides access to the DS for associated non-AP STAs as described in 4.5.2.1 (Distribution)





*Figure 540-4 – proposed update to Figure 5-4*

**5.1.5.3 Mesh STA role**

The MAC data plane architecture of a mesh STA is completed by replacing the role-specific behavior block with that shown in Figure 5-5. The function of this block in a mesh STA is described in 9.34 (Mesh forwarding framework). This role is not applicable when transparent FST is used, and does not apply to Figure 5-2.





*Figure 540-5 – proposed update to Figure 5-5*

**5.1.5.4 Mesh gate role**

The MAC data plane architecture of a mesh gate is completed by replacing the role-specific behavior block with that shown in Figure 5-6. The function of this block in a mesh gate is described in 13.11 (Interworking with the DS). This role is not applicable when transparent FST is used, and does not apply to Figure 5-2.





*Figure 540-6 – proposed update to Figure 5-6*

For 11ak:



Questions for discussion:

* Is the MAC Service provided to the relay function (in the original figures) or the DS (in the new figures), the same as the MAC Service provided to LLC?
	+ *Proposed response: No. In fact, the MAC Service isn’t provided to the DS, it is provided to a selection function that decides between local and non-local destination. Non-local destination frames are passed to the DS via the Distribution System Service, which provides a different service from that provided by the MAC SAP. (See Annex R of IEEE 802.11-2012 for an informative discussion.)*
* Does the above question change if the relay function is doing local forwarding (within the BSS) or using the DS to get to the recipient’s AP?
	+ *The new figure’s approach would say ‘no’, as all non-local frames are treated the same and delivered to the DS, which may immediately loop the frame back in the local forwarding case.*
* How about the Portal case?
	+ *Here again, the DS is a homogeneous service, delivering MSDUs to and from the Portal in the same fashion as it does APs within the ESS.*
* Is a Portal an 802 Bridge? Is the combination of AP, DS and Portal, a logical collection that together form an 802 Bridge?
	+ *None of the components mentioned (AP, DS or Portal) perform the functions described for an 802 bridge per 802.1Q. Therefore, No. Rather, since the operation of these components is transparent to LLC, it seems more natural to model the collection – functionally – as something slightly more than a single end station (because there are multiple MAC Addressable entities within the WLAN system) but less (that is, simpler) than a bridge.*
	+ *Note that a WLAN system may use a bridged 802 network in the provisioning of its services. In particular, the DS explicitly can use any appropriate technology, including an 802 bridged network. This does not affect, nor it is reflected in the architecture, however, as it is left as an implementation option.*
	+ *There is value in recognizing that a WLAN system is not a single end station. In particular, the work of 802.11 TGak and 802.1Qbz has the goal of supporting the optional integration of 802.11 network systems into 802 bridged networks for general use. This requires developing a model (which uses or maps to 802 terminology and concepts) to describe the WLAN system, and which accounts for quality of service, reliability and hop cost metrics unique to wireless. The nature of this modeling is still being debated.*
* With the activities in TGak to add concepts of 802 Bridging to non-AP STAs (in an infrastructure BSS), do the APs also need concepts added to participate in the overall bridging architecture (including, for example, loop-detection)?
	+ *Per the above, this is TBD within TGak.*
* Is the new visualization useful to see that a non-AP STA, when bridging is added (per TGak), adds something like the data plane elements shown as “Unique to AP”. However, such a STA does not add the management plane items of starting or controlling the BSS. This seems to be helpful to scope the nature of the changes needed. Of course, the Distribution System is replaced by a full 802 MAC Relay, per the 802.1Q Figures above, but the concepts have a logical mapping.
	+ *Also, TBD.*
* The last proposal for a replacement Figure 5-1 shows a line that limits the 802.11 scope (to items below the line). In previous architecture discussions, such a limit of 802.11 scope was deemed limiting (particularly in the context of the Reference Model (5.7) discussion in IEEE 802.11-2007). Is this a concern for the new figure?
	+ *If this line is acceptable/desirable, is it in the right place? Note that the 802.1X PAC/SecY is “below” the line, but is arguably not in 802.11’s scope. Although, 802.11 somewhat defines its own Controlled/Uncontrolled port filtering, rather than strictly using 802.1X’s. This part of the figure may still be confusing and/or need work.*
* Note the location of the MAC SAP (designed with “(M)” in the figure). It is well below the “top of the 802.11 stack.” But, also note that above it is only “switching/filtering” type operations, that don’t change the service provided. Is this acceptable/agreed?
* Are the function blocks shown in the “stack” a complete set (and at the appropriate level of detail)? Are they in the right order?
* How many Portals are there in a WLAN system? Zero or one, or can there be multiple? Can there be multiple only if they connect to distinct non-802.11 networks (not two points of access to the same (bridged) network)? (What does “distinct” actually mean in this context, and can we define it?) Care needs to be taken here, or we end up with routing table issues, or their equivalent.
* How can we incorporate the concept of a Mesh STA, Mesh Gate, IBSS STA, or other STA types into the figure? (Or should we try?)

Finally, once decisions are made on the above, consider any updates needed to 802.1Q’s text from 802.1Q-2011, describing mapping of 802.1Q concepts to 802.11 behaviors:

**“6.7.2 Support by IEEE Std 802.11 (Wireless LAN)**

The wireless LAN access method is specified in IEEE Std 802.11, 1999 Edition. Clause 7 of that standard

specifies frame formats, Clause 9 specifies the MAC sublayer function, and Clause 11 specifies the

mandatory MAC sublayer management function.

A Bridge to an IEEE 802.11 LAN shall connect to an IEEE 802.11 Portal, which in turn connects to an IEEE

802.11 Distribution System. For the purposes of bridging, the service interface presented at the Portal is

identical to the service interface presented at the IEEE 802.11 MAC SAP. An instance of an 8802-11

Distribution System can be implemented from IEEE 802 LAN components. IEEE 802.11 STAs attach to the

Distribution System via an IEEE 802.11 Access Point. A bridge shall not connect to an IEEE 802.11

Independent BSS. For a description of the IEEE 802.11 architecture, see Clause 5 of IEEE Std 802.11.

On receipt of an M\_UNITDATA.request primitive, the portal constructs a MAC Service Data Unit and

passes it to the MAC Data service for transmission (in accordance with the frame formats and procedures

specified in IEEE Std 802.11 Clauses 6, 7, 9, and Annex C) using the parameters supplied as specified

below.

On receipt of a valid MAC Service Data Unit (see IEEE Std 802.11 Clauses 6, 7, 9, and Annex C), the portal

generates an M\_UNITDATA.indication primitive with parameter values derived from the frame fields as

specified below.

When processing MSDU\_from\_LLC, the Type subfield of the Frame Control field specified in 7.1.3.1 of

IEEE Std 802.11 shall be encoded as *Data* in MAC frames (see Table 1 in IEEE Std 802.11).

The destination\_address parameter is encoded in MAC frames as the DA described in Table 4 of 7.2.2 of

IEEE Std 802.11.

The source\_address parameter is encoded in MAC frames as the SA described in Table 4 of 7.2.2 of IEEE

Std 802.11.

The mac\_service\_data\_unit parameter is encoded in the Frame Body field (IEEE Std 802.11, 7.1.3.5) of

MAC frames. The length of the MSDU shall be \_ 2304 octets. The length is not encoded in MAC frames;

rather, it is conveyed in the PHY headers.

The user\_priority parameter is not encoded in MAC frames. The user\_priority parameter provided in an

M\_UNITDATA.indication primitive shall take the value of the Default\_User\_Priority parameter for the port

through which the MAC Service Data Unit was received. The default value of this parameter is 0, it may be

set by management, in which case the capability to set it to any of the values 0 through 7 shall be provided.

The Frame Check Sequence (FCS) field of MAC frames is calculated and encoded in accordance with IEEE

Std 802.11, 7.1.3.6.

No special action, above that specified in IEEE Std 802.11, is required for the support of the MAC Internal

Sublayer Service by the wireless LAN access method.”